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STATE OF IDAHO
DIVISION OF
ENVIRONMENTAL QUALITY

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Dirk Kempthorne, Governor
C. Stephen Allred, Administrator

November 30, 1999

Ms. Kathleen Hain, Manager
Environmental Restoration Program
U.S. Department of Energy
Idaho Operations Office
850 Energy Drive
Idaho Falls, Idaho 83401-1563

RE: IDHW/DEQ Technical Review Comments on the *Post-Record of Decision monitoring Report at Operable Unit 4-12, Central Facilities Area Landfills I, II, and III (CFA-01, CFA-02, and CFA-03) (draft)*

Dear Ms. Hain:

The Idaho Department of Health and Welfare/Division of Environmental Quality (IDHW/DEQ) has completed its review of the above-referenced document, and provides the enclosed comments. IDHW/DEQ received the draft monitoring report in September, 1999. This document under the FFA/CO (Sections 8.5 and 8.7) is not considered a primary nor a secondary document and therefore is not subject to a specified period for review and comment.

If you have any questions regarding these comments, please contact me at (208)373-0556.

Sincerely,

Clyde Cody

Clyde Cody
WAG 4 Manager
IDHW/DEQ Technical Services Group

cc: Daryl Koch, DEQ-BOI
Carol Hathaway, DOE-ID
Keith Rose, EPA Region X
File, DEQ-IF

IDHW/DEQ Technical Review Comments on the *Post-Record of Decision Monitoring Report at Operable Unit 4-12, Central Facilities Area Landfills I, II, and III (CFA-01, CFA-02, and CFA-03) (draft)*

General Comments

1. First, this is one of the more comprehensive analyses that our group has seen for the INEEL. The author(s) are to be commended for their thorough evaluation.

2. The graphical presentation of both the neutron probe and TDR data could be improved significantly. For example, placing 10-12 neutron probe sampling events on the same graph prevents any type of analysis. At a minimum only data from a particular water year should be presented and, if in fact most infiltration/recharge is associated with snowmelt, then only a series of events from approximately February through August is valuable. The legend of the TDR graphs is mostly indecipherable.

3. Given that we are most concerned about water movement through waste it is difficult to understand the value of understanding moisture conditions in any of the NATs except those which are installed in waste (only LF 2-07). Having soil cover over native soils probably allows for deeper soil rooting depths and more efficient soil water extraction and less deep percolation. The installation of additional NATs and/or TDR arrays in areas of the landfill with waste would be recommended.

4. Some of the TDR data, while it only extends to two feet, does not support the ET depths that were selected, based on neutron probe data. For example, in Figure C-13 (Landfill I) there does not appear to be significant decreases in moisture content at the two foot depth until July or August and several of the arrays show increases. By this time of year the bunchgrasses have begun to senesce and moisture extraction is decreasing. It is difficult to support a significantly deeper ET zone for this analysis given these types of data.

5. There is not general agreement with the recommendations made for enhancements to the soil moisture monitoring program. Given the spatial and temporal variability observed with this monitoring I would argue that additional monitoring points located in the cover over waste are needed. If the TDR arrays are to be used the validity of the universal equation for the soil types being monitored should be demonstrated. Much better calibration of the existing and any new NATs needs to be done. I would also recommend that the process be started to develop performance criteria against which this data could be compared. Without performance criteria for comparison, collection of the information is of marginal utility.

Specific Comments

1. **Executive Summary, third paragraph of Soil Vapor Monitoring and Contaminant Leaching Evaluation section, page viii**

   A better explanation is needed to understand the following statement: "Based on levels of VOCs in the vadose zone at RWMC and the resultant impact on groundwater, it is unlikely that the observed concentrations at the CFA landfill will impact the SRPA above MCLs." Please explain.

2. **Executive Summary, Water Level Monitoring, page ix**

   An additional bullet should be added to the list of recommendations. That bullet calls for the evaluation of the ground water elevation data in light of the distribution of transmissivities in the area of interest. The rational for this bullet will be detailed in subsequent comments.

3. **Executive Summary, Groundwater Sampling, Last bullet, page x**

   Up to three additional monitoring wells are needed to adequately ensure that potential ground water contamination is not escaping from the landfills. Should the water table contour map in Figure C-23 be more correct than Figure C-24, we have inadequate ground water monitoring well coverage for Landfills I, II, and III. Ground water flow directions below Landfill I are probably toward the south with either interpretation. Another ground water monitoring well is needed now to cover this gap. Landfill II is inadequately covered if interpretation Figure C-23 is more accurate as flow will be more toward the southeast. A ground water monitoring well is needed to the west of Landfill III if Figure C-23 is more accurate. The need for the wells also is indicated by the presence of volatile organic compounds, via vapor port sampling and analysis, at the first interbed below the ground surface. Modeling for OU 7-08 indicates that very small vapor concentrations are needed to cause an unacceptable concentration of that contaminant in the ground water. Organic compounds have been detected in the ground water at CFA for several years and may be attributable to the landfills.

4. **Executive Summary, Groundwater RI/FS Investigation section, page x**

   Please indicate in parenthesis which wells constitute the Sewage Treatment Facility monitoring wells.

5. Section 2.2.1, last paragraph of section, top of page 2-9

In the discussion concerning the discontinuous nature of the interbeds beneath CFA, add Figure 2.5 to the figures demonstrating the discontinuous nature of interbeds (in fact Figure 2.5 is more illustrative than Figure 2.6).

6. Section 2.3, Paragraph 2, page 2-9

Please add a citation to the last sentence regarding the magnitude of potential evapotranspiration compared to actual evapotranspiration.

7. Section 3.1.1, Bullet 1, page 3-1

Please cite the appropriate document wherein this criterion was established and agreed to by the three agencies.

8. Section 3.2.1.1, third paragraph on page 3-3

It is stated in this paragraph that several hundred counts out of several thousand can be considered error ("not necessarily an indication of moisture movement"). This measurement error should be taken into account in the estimation of the depth of evapotranspiration.

9. Section 3.2.1.1, Neutron Probe Calibration, Measurement, and Interpretation discussion, page 3-5

If this monitoring is to have any value and if performance criteria are to be developed, the calibration of the neutron probes is inadequate in several respects.

First, the range of moisture contents measured for the two soil types does not extend across the range of moisture contents which could potentially be measured in these materials. With layering of clays and sands the potential for higher moisture contents occurring is increased. The number of points used in developing the curves is insufficient.

Second, using moisture content data from boreholes distant from the actual NAT is insufficient.

Third, arbitrarily assigning calibration curves for certain soil types for the NATs on the landfill, based on some arbitrary probe count (see Table A-6 and page A-2) has no basis.

Because of the significant moisture content difference between sands and clays at the same probe count (2% vs 15% or more), the amount of error in storage estimates possible is very large. This is essentially inappropriate for NAT LF 2-07 because it was driven through waste, whose moisture holding characteristics may not respond at all like sand and clay.

10. Section 3.2.1.1, last paragraph of section, page 3-5, and page A-2

The depth of evapotranspiration (ET) was determined for each NAT based on an evaluation of drainage observed in each 1 foot increment and was estimated to be 5 to 6 feet in depth. The specific value used for each NAT is not stated. Examination of figures A-7 through A-11 could easily lead to an interpretation of shallower ET depths of 3 to 4 feet. In the case of LF 2-07 where the thickness of the soil cover is only four feet it is not reasonable to assume roots will extend into the waste and in fact in the earlier data analysis done with this NAT they were not assumed to do so. In the case of the other NATs, where new soil cover was placed, seeding was done in the Spring/Fall of '97, with data gathered only through August 1998. This is not adequate time for grasses, via seeding, to establish roots over six feet deep. The Anderson study, where a rooting depth of 63 inches is quoted used transplanted bunchgrass starts which were able to develop a significant rooting system in a short time frame.

11. Section 3.2.1.2, Equation 3-1, page 3-6

A universal TDR calibration equation is used to convert TDR data to moisture content. There are several "universal calibration equations that have been developed. Please state the rationale for selection of the one used in this monitoring program. If the TDR arrays are extended deeper, does this equation have any weaknesses when applied to the varying soil conditions found at CFA, that is, alternating sands, gravels and clays.

12. Section 3.2.1.2, discussion at top of page, page 3-8

The monitoring results (see Table 4-1, page 4-3) do not support the HELP model results discussed here, and would argue that more extensive monitoring via TDR be conducted. Please discuss.

13. Section 3.2.4.1, page 3-13

An electric water level indicator was used to measure the depths to ground water. Please verify the accuracy to which the indicators are calibrated. Personal experience with this

type of equipment indicates a wide range in accuracy for precisely measuring depths to ground water which are then converted to elevations. Where hydraulic gradients are small, say 1 ft/mile, it is imperative that precise measurements be made to ultimately determine the direction of ground water flow. It is recognized that borehole deviation is a significant contributor to this measurement and that barometric effects are significant at the site.

14. Section 4.1, first paragraph , page 4-1

It was the intent to establish performance criteria for the landfill covers based on the findings of this report as stated. It is recommended that the predicted pass-through infiltration rates from the original HELP modeling be established as performance criteria. These rates would then be consistent with the rates used as a guide for the NRF landfills. It is acknowledged that we do not know at this time what an acceptable infiltration rate can be to prevent an unacceptable level of concentrations in the aquifer. This criteria can be assessed in the next five year review.

It would be beneficial to state in Section 4 or 4.1 the total annual precipitation during the period of monitoring. A graphical depiction of the monthly precipitation would be even more useful for the subsequent discussions.

15. Section 4.1.2.1, first paragraph of section, page 4-4

It is stated that changes in moisture content at 24 inches cannot be clearly attributed to up or down movement of water. However, when data at several depths is examined it should be possible to state if water movement is up or down. For example, if we see decreases or stable moisture content in shallower layers, and if this occurs after precip events or under low ET conditions such as early spring, the likelihood is high that moisture movement is downward.

16. Section 4.2, fourth paragraph, page 4-8

The last sentence of this paragraph states that "Based on levels of VOCs in the vadose zone at RWMC and the resultant impact on groundwater, it is unlikely that the observed concentrations at the CFA landfills will impact the SRPA above MCLs." There is no evidence presented to support this statement. On the contrary, it can be argued that very small vapor concentrations are needed to exceed the MCL as evident by the exceedances of the MCL for carbon tetrachloride and the apparent low vapor concentrations needed at the RWMC to cause an exceedance. The modeling conducted for the RWMC supports

the concept that small concentrations are needed at the water table interface to exceed the MCL.

DEQ estimates that a concentration of 0.16 mg/l 1,1,1-trichloroethane vapor is needed to hit an MCL of 0.2 mg/l in the ground water. Vapor concentrations in these shallow vapor ports at CFA, near the highest interbed, have been measured in the range of no detect to 14,000 ppbv. Please include more information to support the conclusion noted.

17. **Section 4.3.2.1, Chloride, page 4-26**

The citation for Frederick and Behymer 1999 is not cited in the reference list in section 7. Please include the citation.

18. **Section 4.3.2.1, Nitrate discussion, pages 4-27, -28, & -29**

Because this is a draft report and additional data are now available to help identify the source of the nitrate, it is suggested that this section be revisited and updated. The nitrogen isotope data are useful and the soon to be received oxygen isotope data may further aid in identifying the source or sources of nitrate in the ground water. Further evaluation of the water table configuration and transmissivity distribution may aid in the evaluation too. Please revise the report upon receipt and evaluation of the remaining data and re-analysis of the water table configuration.

19. **Section 5.2, third paragraph, page 5-2**

The conclusion stated in the last sentence requires justification. Please note the comment on Section 4.2 and provide the justification and rational.

20. **Section 6.3.2, bullet 4, page 6-2**

Additional ground water monitoring wells are needed so that data can be collected and analyzed for the 5 year review. Please see the comment on Executive Summary, Page x

21. **Appendix C, Figures C-23 & C-24**

These water table configurations should be reconsidered given the distribution of transmissivities suggested by Table 2-2 on page 2-14. Also, the recharge of waste water

at the INTEC percolation ponds and the presence of production wells at CFA may be affecting the contour configuration to a great degree when combined with the indicated distribution of transmissivities. The irregularities in Figure C-23 may be a closer approximation to reality than the smoothed contours shown on Figure C-24, again due to the distribution of transmissivities. Please re-evaluate these figures and possibly do some simple steady state ground water flow modeling to assess alternate conceptual models of flow in this area.